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Promoting Readiness through Environmental Stewardship

A Multiobjective Model for Management of the Complex Calculus Involved in the Environmental Cleanup Negotiation Process

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Presentation Outline

- **I. Summary**
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 - B. Product
 - C. Subproducts
- **II. Research**
 - A. Background
 - B. Data Gathering and Model Formulation
- **III. Conclusions**
 - A. Contributions and Significance
 - B. Recommendations for Future Research



I. Summary

- Technical aspects of the environmental cleanup management process are well documented (i. e., choices of scientific processes to mitigate contaminated sites)
 - Relatively little documentation exists on DOD management of the environmental cleanup process. Management issues are largely anecdotal and usually involve cleanup negotiations and the conditions under which they occur

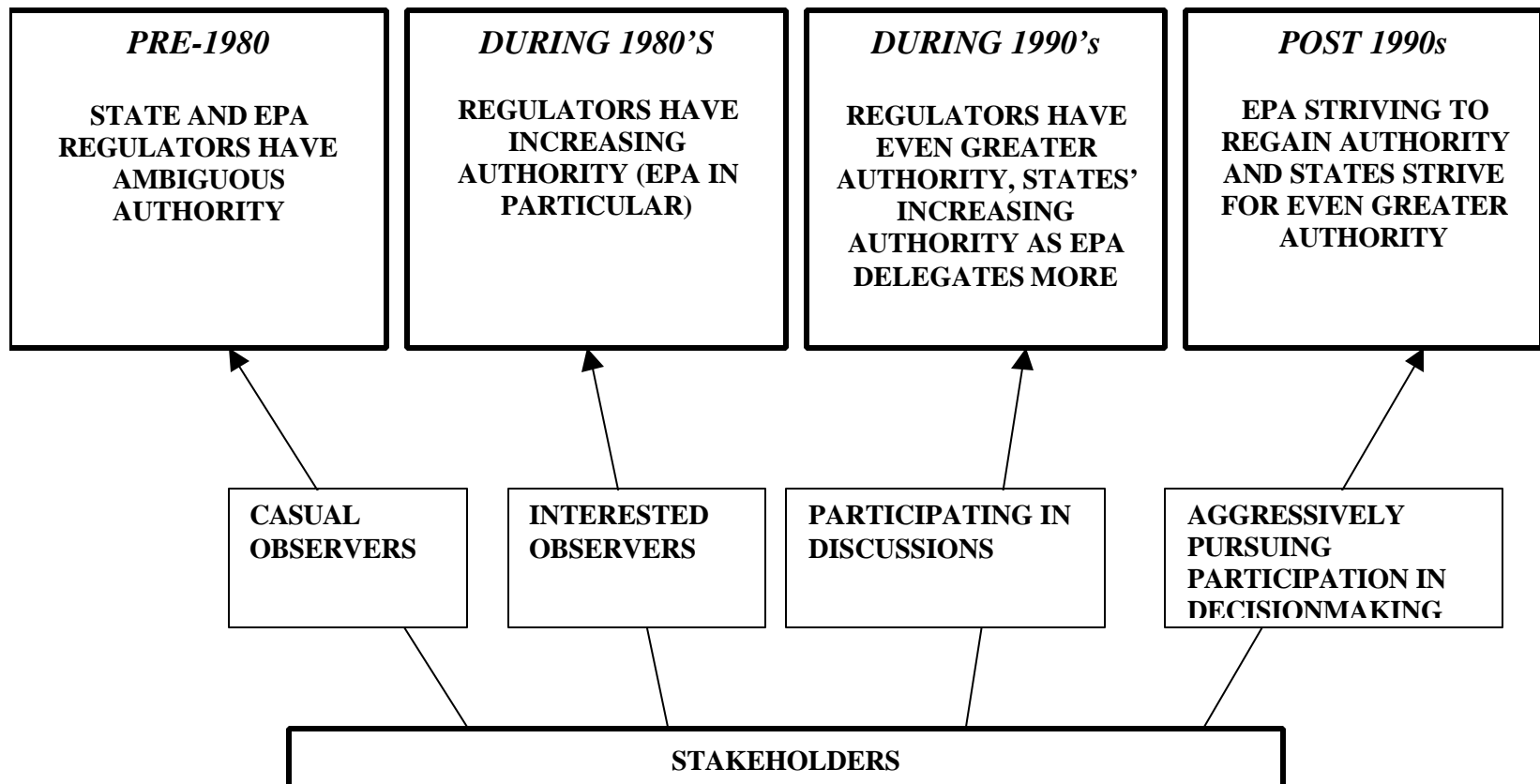


A. Purpose

- Complexities surrounding the DOD environmental cleanup process emphasize need for research
 - Evolution of objectives and consequent increasing influence of outside parties on the DOD environmental cleanup process
 - Emerging and ever-changing requirements affecting these objectives
 - Funding limitations affecting cleanup process



Evolution of Objectives - Stakeholder and Regulatory





A. Purpose

- RAND Corporation and National Science Board studies emphasized the need for research on environmental decisionmaking processes and management of environmental cleanup programs
- RAND study focused on the United States Department of Defense (DOD)



A. Purpose

- Important because:
 - Multiple objectives (from outside parties) influencing the negotiation of environmental cleanup decisions drive the choices of environmental cleanup remedies via the negotiating process
 - The types of remedies chosen as a result of the negotiations determine the overall cost of the cleanup program



A. Purpose

- Research provided a new process to improve management of the environmental cleanup decisionmaking process
 - focused on US Department of Defense and the negotiating techniques used in environmental cleanup decisionmaking
 - provides a framework that enables decisionmakers to address the multiple objectives influencing management of the DOD environmental cleanup process more effectively



B. The Product

- The product was a model to improve the way in which environmental cleanup negotiation techniques are chosen and conducted at DOD installations. Complex calculus of multiple objectives, complicated by emerging requirements and limited funding, underscore the need for this research.
 - Underlying the problem is the essence of the environmental cleanup negotiation process - very dynamic



B. The Product

- Product formulation involved:
 - Modeling the complex calculus of objectives influencing environmental cleanup management
 - via
 - Synthesis of generalized conditions at military installations specific to those objectives
 - and
 - Superimposition with commonly used DOD negotiating techniques



C. Subproducts

- Subproduct 1: Develop an objectives hierarchy, stating what the research is trying to achieve
- Subproduct 2: Identify relevant negotiating processes/approaches/techniques
- Subproduct 3: Identify the highest ranking (most important) objectives from the objectives found in Subproblem 1
- Subproduct 4: Compare capabilities of techniques from Subproduct 2 by applying them to conditions/situations for the objectives from Subproduct 3



C. Subproducts

- Subproduct 5: Select the most widely applicable negotiating techniques from Subproblem 4, and specify which technique works best under what situations. Model this process using the Analytical Hierarchy Process (AHP)
- Subproduct 6: Select a “test bed” and apply the new methodology. Evaluate the results in terms of the model developed in Subproblem 5
- Subproduct 7: Evaluate conventional approach in terms of the evaluation criteria used for the model. Evaluate the proposed model by comparing it with conventional decisionmaking processes for DOD cleanup negotiations



Comments

- Examined AHP appropriateness. Research showed AHP is “point of departure” for model.
- Used specific installation with negotiations already resolved - Rocky Mountain Arsenal

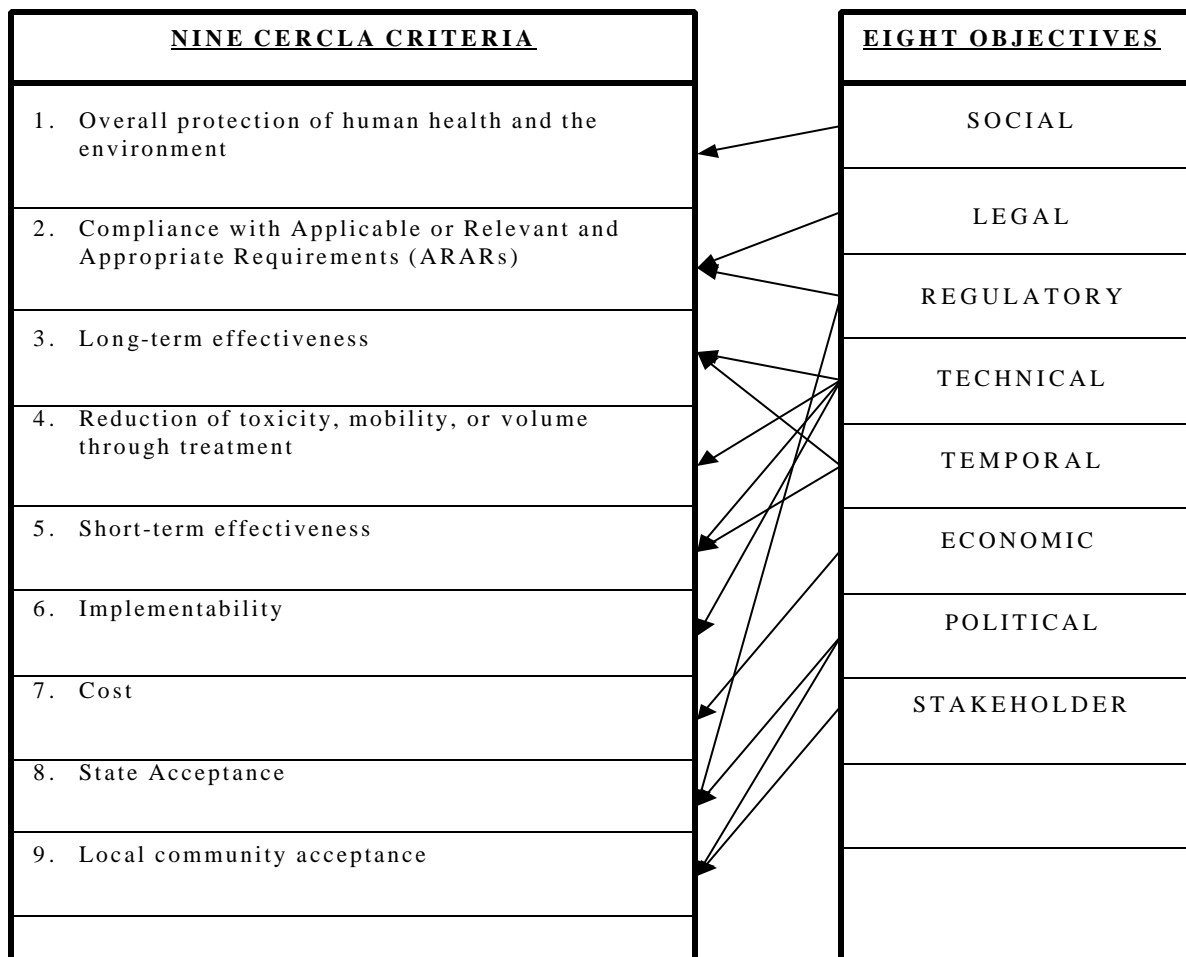


II. Research Accomplished

- A. Background
 - Derivation of Eight Objectives - Definitions
 - Evolution/Growth Trend of Environmental Legislation
 - Environmental Cleanup Funding Trend
 - CERCLA and RCRA Processes
 - Emerging Requirements
 - Evolution of Negotiating Strategies



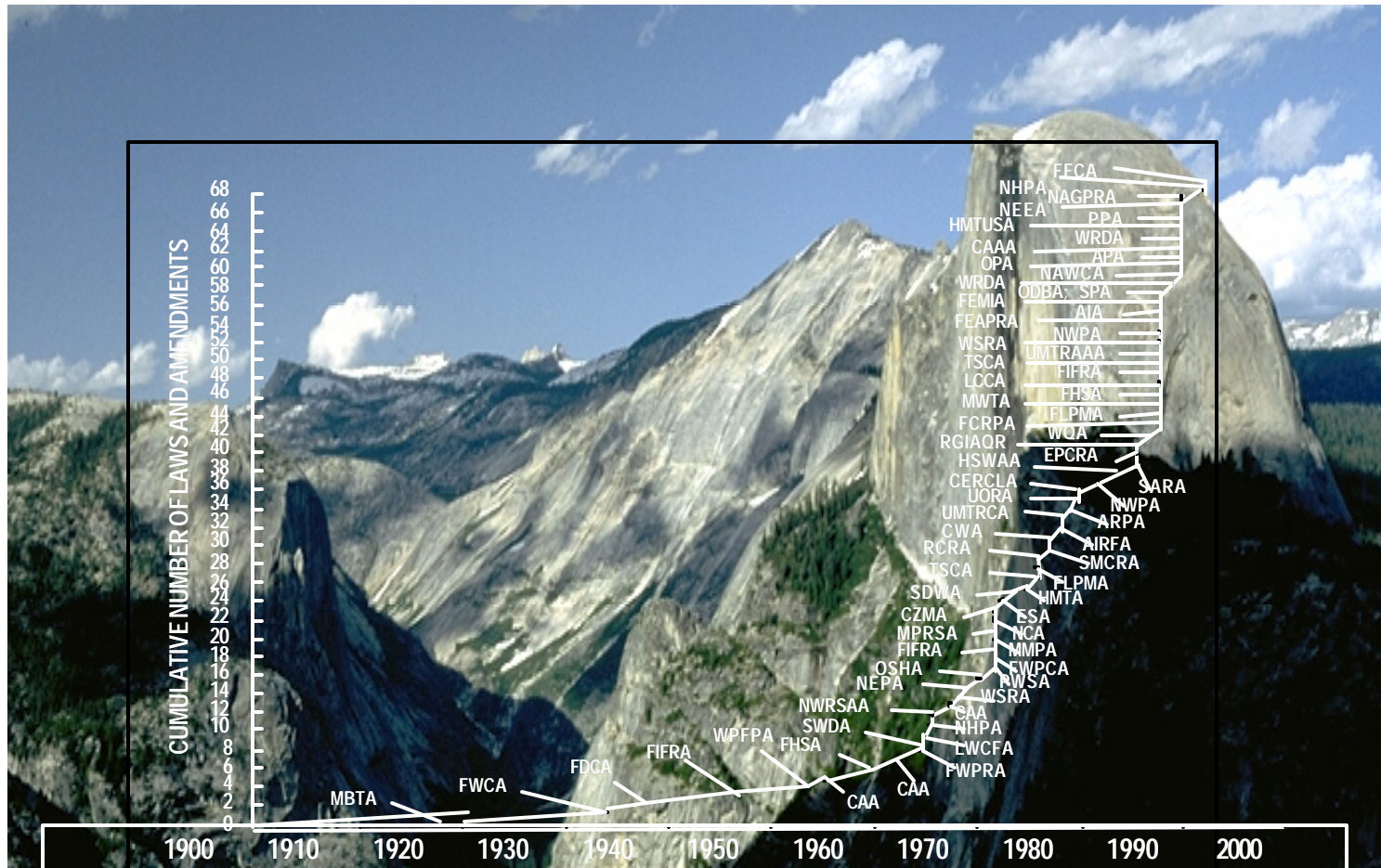
How CERCLA Criteria and Research – Derived Eight Objectives Influencing the DOD Environmental Cleanup Process



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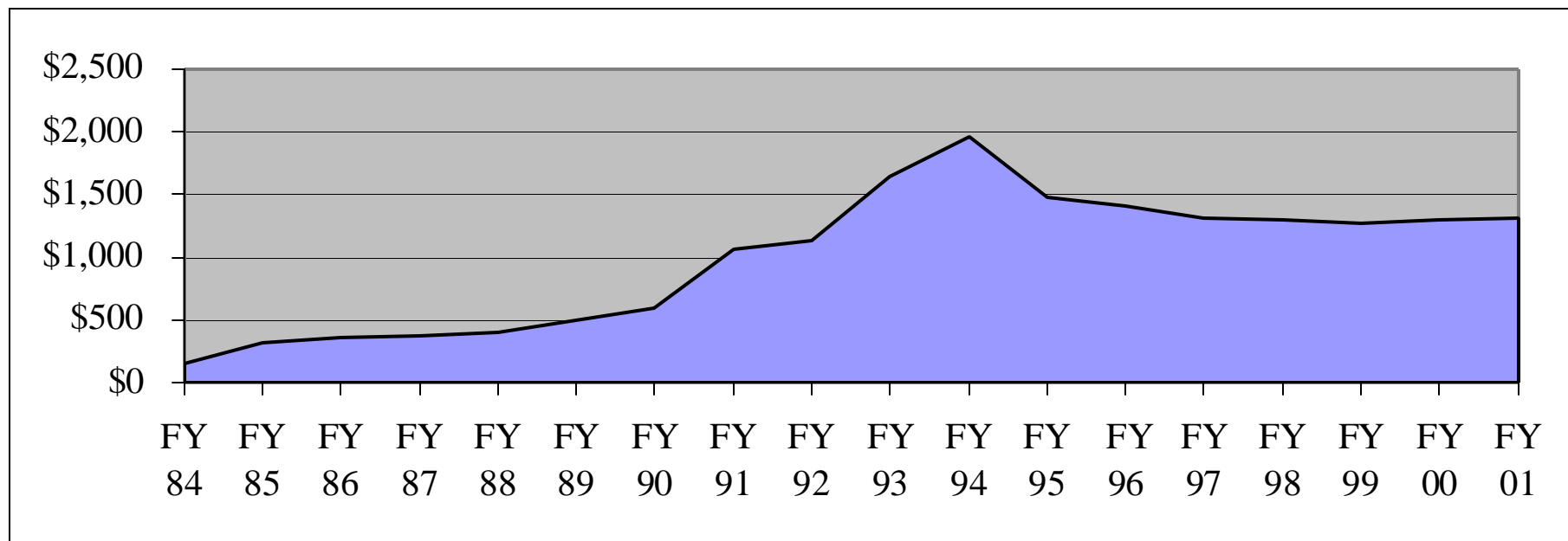
Growth Trend in Environmental Legislation



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Department of Defense Environmental Cleanup Funding Trend (\$million)



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Emerging Requirements

- Unexploded Ordnance Cleanup
- Base Closure
- Reopening Records of Decision (RODs)
- Environmental Protection Agency vs. State Regulators
- Formerly Used Defense Sites (FUDS)
- New Legal Requirements - Pesticide Disposal
- Waiver of Sovereign Immunity Under CERCLA
- RCRA/CERCLA overlap



Evolution of Negotiating Strategies

	Pre-SARA	SARA	Post-SARA	Emerging
EPA	Ambiguous	EPA lead at NPL sites	EPA lead at NPL sites, but with greater State involvement, due to increased RCRA authority under FFCA	Exploring new cleanup authorities under SDWA and RCRA
States	Ambiguous	State lead at non-NPL sites, with ARARs at NPL sites	Increased State involvement and authority due to FFCA and as parties to FFA's	Pressing for greater authority – seeking CERCLA waiver of Sovereign immunity
Stakeholders	Ambiguous	Ambiguous	Increased involvement as a result of TRCs and RABs	Seeking to increase role and influence, more litigation
Key Developments	Major cleanup controversies – McClellan AFB, Rocky Mountain Arsenal	Codification of the DOD cleanup program as a part of SARA; creation of Federal Facilities Compliance Office in EPA	RCRA/CERCLA overlap due to FFCA enactment; potential regulation of munitions and UXO; BRAC issues; growing emphasis on FUDS	Greater emphasis on UXO cleanups; paints and pesticides; munitions by-products, BRAC issues; opening RODs
Negotiating Strategy	Site and circumstance specific	FFA with EPA/MOU or consent Agreement with States at non-NPL bases	FFAs with EPA and States at NPL sites. State role growing	Less reliance on FFAs – EPA and State orders, consent decrees. Uncertainty over venue

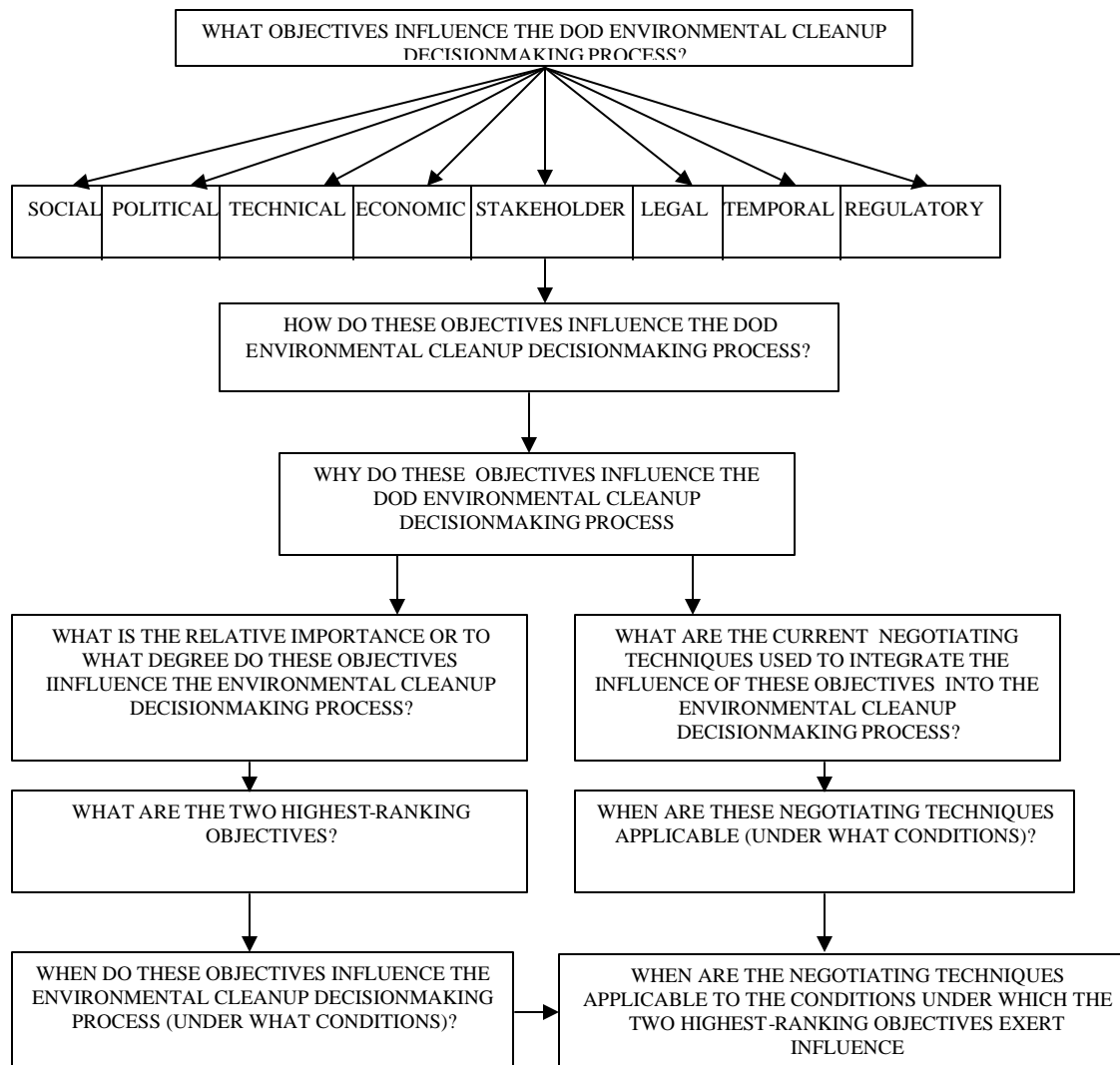


B. Data Gathering and Model Formulation

- Model formulation involved a series of inquiries - outlined logic sequence
- Data gathered in the form of two Surveys - the **first** (and only currently existing) data of its kind for the Department of Defense. Survey data (from both surveys) are the first data to be gathered on the subject of environmental cleanup negotiations and the conditions (qualitative and quantitative) under which they occur



Inquiries for Model





B. Data Gathering and Model Formulation

- Surveys yielded ranking of objectives and conditions under which negotiations occur at installations
- Regulatory and Stakeholder objectives ranked # 1 and # 2 after consideration of the other six objectives as constraints or limiting factors (“Satisficers”) i. e., - “minimum sufficing” constraints on the environmental cleanup process
- DOD has greater potential to influence regulatory and Stakeholder objectives



B. Data Gathering and Model Formulation

- Model started as Analytical Hierarchy Process (AHP) - identify method for choosing the best negotiating technique under environmental cleanup decisionmaking conditions at military installations
- Objectives, evaluation criteria, and alternatives were identified
- Evaluation criteria for negotiation techniques were: (1) applicability to generalized installation conditions that were caused by the influence of the two most important objectives identified by the research; and (2) quality of the solution (type of agreement)



B. Data Gathering and Model Formulation

- “Influence of objectives hierarchy” provided by survey data and by pairwise comparison (AHP technique) of interdependencies of objectives. Survey data and pairwise comparison provided same hierarchy of objectives according to influence:

1 Regulatory

#2 Stakeholder



B. Data Gathering and Model Formulation

- Research explored two different concepts for AHP modeling
- AHP model did not fit all conditions of model - because of variability of situations at installations
- Researcher made decision to use AHP as a “point of departure”
- Then formulated “applicability” charts for negotiating techniques to Generalized Conditions

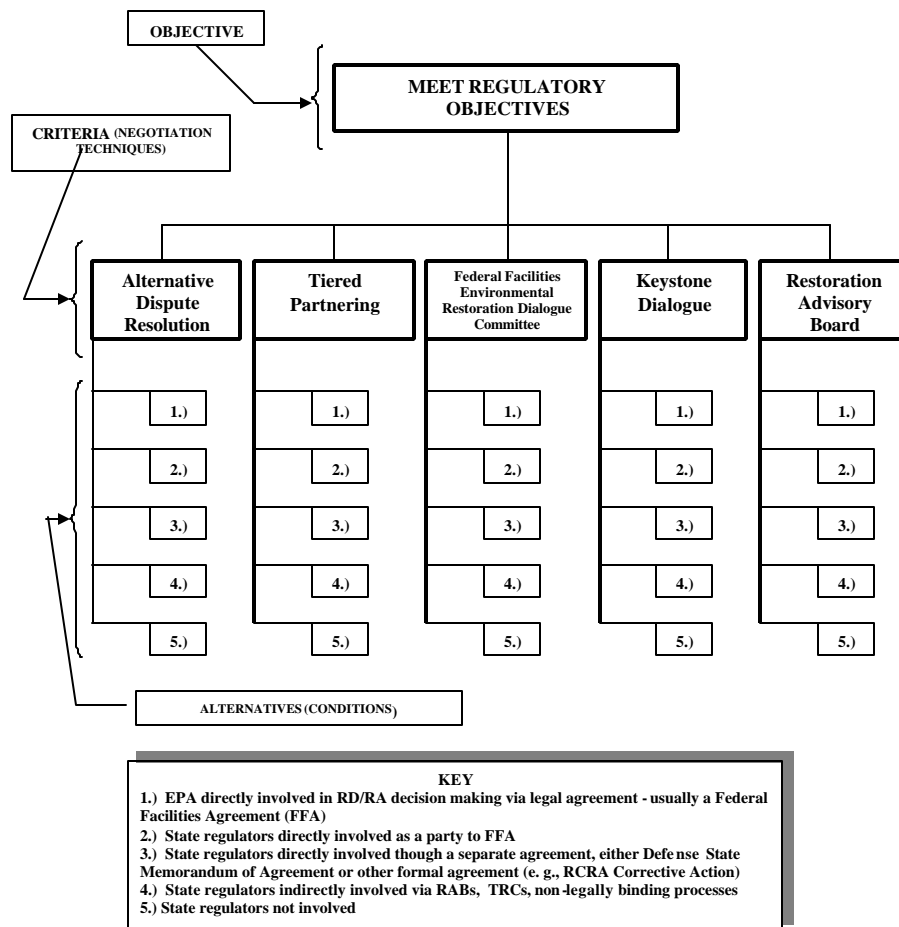


B. Data Gathering and Model Formulation

- Superimposed negotiating techniques on installation conditions
- Model was demonstrated in a generic example and specific example of Rocky Mountain Arsenal
- Model was proven in the Rocky Mountain Arsenal example

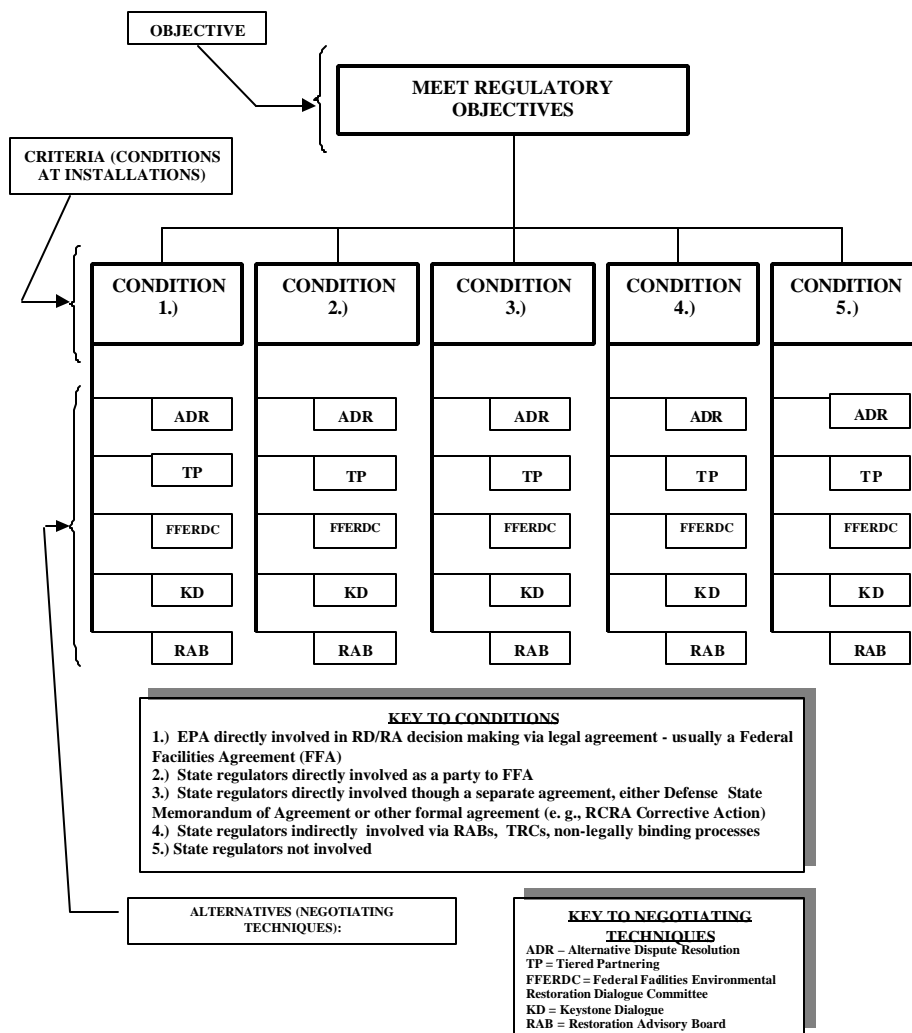


Hierarchy Using Negotiation Techniques as Criteria





Hierarchy Using Conditions at Installations as Criteria





ANALYSIS OF NEGOTIATING TECHNIQUES IN MODEL

NEGOTIATING TECHNIQUE	#1 OBJECTIVE					#2 OBJECTIVE				
	CONDITIONS					CONDITIONS				
	1	2	3	4	5	1	2	3	4	5
Alternative Dispute Resolution										
Tiered Partnering										
Federal Facility Agreements										
Defense State Memoranda of Agreement										
State Multi - Agency Agreements										
Federal Facilities Environmental Restoration Dialogue Committee										
Keystone Dialogue										
Restoration Advisory Boards										



EXAMPLE: BASE A

- **# 1 Objective = Regulatory**
 - **Possible Conditions - as they apply to the Remedial Design/Remedial Action (RD/RA) phase of cleanup:**
 - 1.) EPA directly involved in RD/RA decision making via legal agreement - usually a Federal Facilities Agreement (FFA)
 - 2.) State regulators directly involved as a party to FFA
 - 3.) State regulators directly involved though a separate agreement, either Defense State Memorandum of Agreement or other formal agreement (e. g., RCRA Corrective Action)
 - 4.) State regulators indirectly involved via RABs, TRCs, non-legally binding processes
 - 5.) State regulators not involved



EXAMPLE: BASE A

- **#2 Objective = Stakeholder**
 - **Possible Conditions - as they apply to the Remedial Design/Remedial Action (RD/RA) phase of cleanup**
 - 1.) Stakeholders directly involved - through writing letters to Congress, newspapers, television, political activities
 - 2.) Stakeholders directly involved through contact with regulatory agencies (State and EPA)
 - 3.) Stakeholders indirectly involved through RABs, discussion groups, public meetings, organized participation
 - 4.) Stakeholders indirectly involved, but no organized participation
 - 5.) Little or no Stakeholder involvement



EXAMPLE: BASE A

- **The situation at Base A:** NPL listing, State regulators are party to a DSMOA not an FFA and participate in the RAB. Stakeholders are involved through contact with regulatory agencies and through the RAB, but are not politically active. Therefore, the following conditions apply under their objectives:
 - **Regulatory:** Conditions 1, 3, and 4
 - **Stakeholder:** Conditions 2 and 3



ANALYSIS OF NEGOTIATING TECHNIQUES IN MODEL

NEGOTIATING TECHNIQUE	REGULATORY OBJECTIVE					STAKEHOLDER OBJECTIVE				
	CONDITIONS					CONDITIONS				
	1		3	4			2	3		
Alternative Dispute Resolution	X		X							
Tiered Partnering	X		X				X			
Federal Facility Agreements	X									
Defense State Memoranda of Agreement	X		X							
State Multi - Agency Agreements			X							
Federal Facilities Environmental Restoration Dialogue Committee				X			X			
Keystone Dialogue				X			X			
Restoration Advisory Boards				X			X	X		

Distribution of Applicability of Negotiating Techniques to Conditions Caused by Objectives at Base A

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III. Conclusions

- A. Results
 - Provides a framework for understanding the DOD environmental cleanup negotiating process, and the consequent management decisions that are made
 - Provides an assessment of how and why objectives evolved to influence the DOD environmental cleanup process, using the evolution of the major environmental laws as a foundation



A. Results

- Provides a new procedure to help resolve the problem of environmental cleanup decisionmaking by using a new modeling approach that considers generalized conditions at military installations
- Provides a new modeling technique for addressing the complex “calculus” - including qualitative and quantitative aspects - of objectives influencing the DOD environmental cleanup negotiating process - reflects “real world”



A. Results

- Provides the first survey data ever collected for DOD installations regarding conditions under which objectives influence environmental cleanup decisionmaking
- Provides the first survey data ever to be used to rank objectives that influence the DOD environmental cleanup decisionmaking process
- Provides a model that can be generalized to many other decisionmaking processes, not just for DoD environmental cleanup decisionmaking



B. Recommendations for Future Research

- Recommend research on whether or not DOD should revitalize its partnering efforts with regulators - begin with analysis of differences and similarities among DOD vs. other federal vs. non-federal agencies
- Recommend research into restructuring the framework of the environmental cleanup decisionmaking process pertaining to stakeholder and regulatory involvement
- Recommend research on how to balance the influences of the eight objectives identified



B. Recommendations for Future Research

- Recommend research on mathematically modeling the degree of influence of the objectives on negotiations that occur during the environmental cleanup decisionmaking process

